CLAIMS

1. A method for producing Ti or Ti alloys through reduction by Ca, the method comprising:

a reduction step in which a molten salt, containing $CaCl_2$ and having Ca dissolved therein, is held in a reactor vessel, and a metallic chloride containing $TiCl_4$ reacts with said Ca in the molten salt to generate Ti particles or Ti alloy particles in said molten salt; and

a separation step in which the Ti particles or Ti alloy particles, generated in said molten salt, is separated from said molten salt.

2. A method for producing Ti or Ti alloys through reduction by Ca according to claim 1, wherein said molten salt containing $CaCl_2$ is a molten salt containing $CaCl_2$ and NaCl.

3. A method for producing Ti or Ti alloys through reduction by Ca according to claim 1, wherein said metallic chloride containing $TiCl_4$ is a mixed gas containing $TiCl_4$ and other metallic chloride.

4. A method for producing Ti or Ti alloys through reduction by Ca according to claim 1, wherein, by holding a molten metal containing Ca on a molten salt, Ca is supplied from the molten metal to the molten salt located below.

5. A method for producing Ti or Ti alloys through reduction by Ca according to claim 4, wherein said molten metal containing Ca is a molten metal containing Ca and Mg.

6. A method for producing Ti or Ti alloys through reduction by Ca according to claim 1, wherein $CaCl_2$ being a by-product associated with the generation of Ti or Ti alloys is discharged outside the reactor vessel.

7. A method for producing Ti or Ti alloys through reduction by Ca according to claim 6, including an electrolysis step of electrolyzing $CaCl_2$, being discharged outside the reactor vessel, into Ca and Cl_2, wherein Ca generated by the electrolysis step is used for the generation reaction of Ti or

Ti alloys in the reactor vessel.

8. A method for producing Ti or Ti alloys through reduction by Ca, the method comprising a combined system of a reduction step and a circulation-type electrolysis step, wherein said reduction step includes the steps of: holding a molten salt, containing $CaCl_2$ and having Ca dissolved therein, in a reactor vessel; and reacting a metallic chloride containing $TiCl_4$ with Ca in the molten salt to generate Ti particles or Ti alloy particles in the molten salt, and wherein said circulation-type electrolysis is configured that a molten salt, being used for producing said Ti or Ti alloys and discharged from said reactor vessel, is electrolyzed to generate and replenish Ca in said molten salt which is returned to said reactor vessel, and wherein, in electrolyzing as above, an alloy electrode made of a molten Ca alloy is employed for a cathode.

9. A method for producing Ti or Ti alloys through reduction by Ca according to claim 8, wherein, in said electrolysis step, a molten salt within an electrolytic cell, together with the interface between a molten Ca alloy, constituting said alloy electrode, and said molten salt, is divided into an anode side and a counter-anode side by installing a partition wall, and wherein a molten salt to be supplied from said reactor vessel is introduced on said counter-anode side.

10. A method for producing Ti or Ti alloys through reduction by Ca according to claim 8, includes a Ti separation step in which the generated Ti particles or Ti alloy particles are separated from a molten salt within or outside said reactor vessel, wherein, in a discharging step in which a molten salt being used for generating Ti particles or Ti alloy particles is discharged outside said reactor vessel, Ti particles or Ti alloy particles generated in a molten salt are discharged, together with said molten salt, outside the reactor vessel, and wherein, in said Ti separation step, said Ti particles or Ti alloy particles are separated from a molten salt discharged outside the

reactor vessel, and wherein, in said electrolysis step, the molten salt from which said Ti particles or Ti alloy particles are separated and removed is electrolyzed.

11. A method for producing Ti or Ti alloys through reduction by Ca according to claim 1 or claim 8, wherein, in said electrolysis step, a metallic chloride containing $TiCl_4$ is supplied in a molten salt.

12. A method for producing Ti or Ti alloys through reduction by Ca, the method comprising:

a Ca generation step by electrolyzing, wherein a molten salt containing $CaCl_2$ is electrolyzed by employing a molten Ca alloy as a cathode to increase a Ca content ratio in said molten Ca alloy;

a Ca replenishment step, wherein the molten Ca alloy in which Ca has increased by the Ca generation step gets contacted with the molten salt containing $CaCl_2$ to have Ca dissolved in said molten salt; and,

a Ti generation step by a reducing reaction, wherein a metallic chloride containing $TiCl_4$ is supplied into the molten salt in which Ca gets dissolved in the Ca replenishment step to thereby generate Ti particles or Ti alloy particles in the molten salt.

13. A method for producing Ti or Ti alloys through reduction by Ca according to claim 12, further including a Ti separation step in which Ti particles or Ti alloy particles generated in a molten salt are separated from the molten salt.

14. A method for producing Ti or Ti alloys through reduction by Ca according to claim 12, wherein a molten salt containing $CaCl_2$ is held in an electrolytic cell as well as a reactor vessel, and wherein a Ca generation step by electrolyzing proceeds within the electrolytic cell, while transferring a molten Ca alloy from the electrolytic cell to the reactor vessel, to undergo a Ca replenishment step as well as a Ti generation step, and wherein the molten Ca alloy in which Ca is consumed within the reactor vessel returns

to the electrolytic cell.

15. A method for producing Ti or Ti alloys through reduction by Ca according to claim 14, wherein the temperature of molten salt in said electrolytic cell is set to be lower than that of molten salt in said reactor vessel.

16. A method for producing Ti or Ti alloys through reduction by Ca according to claim 12, wherein, as holding a molten salt containing $CaCl_2$ within a reactor vessel doubling as an electrolytic cell, an electrolysis by employing a molten Ca alloy as a cathode is carried out, while a molten salt within the reactor vessel, together with the interface between said molten salt and the molten Ca alloy, is divided into an anode side and a counter-anode side by installing a partition wall, in which a Ca generation step is carried out on the anode side and a Ca replenishment step as well as a Ti generation step are carried out on the counter-anode side.

17. A method for producing Ti or Ti alloys through reduction by Ca according to any of claims 7, 8 and 12, further including a chlorination step in which Cl_2 generated in said electrolysis step is reacted with TiO_2 to thereby generate $TiCl_4$, wherein $TiCl_4$ generated in the chlorination step is utilized in the generation reaction for Ti or Ti alloys within a reactor vessel.

18. A method for producing Ti or Ti alloys through reduction by Ca according to claim 1 or claim 13, wherein generated Ti or Ti alloys, together with a molten salt, is discharged outside said reactor vessel, and wherein said Ti or Ti alloys are separated from the molten salt outside the vessel.

19. A method for producing Ti or Ti alloys through reduction by Ca according to claims 13, wherein a molten salt being separated from Ti or Ti alloys in a Ti separation step is introduced to a Ca generation step by electrolyzing and/or a Ti generation step by a reducing reaction.

20. A method for producing Ti or Ti alloys through reduction by Ca according to claims 13, wherein a molten salt being separated from Ti or Ti

alloys in a Ti separation step is utilized in a Ti generation step to be reacted with a molten Ca alloy in which Ca is consumed to increase Ca in the molten Ca alloy by unreacted Ca in the molten salt, and then, the molten Ca alloy is used in a Ca replenishment step.

21. A method for producing Ti or Ti alloys through reduction by Ca according to claims 12, wherein said molten salt containing $CaCl_2$ is a multi-element-system molten salt which contains at least one of NaCl, KCL, LiCl and CaF_2 other than $CaCl_2$.

22. A method for producing Ti or Ti alloys through reduction by Ca according to claims 12, wherein said metallic chloride containing $TiCl_4$ is a mixture of $TiCl_4$ and other metallic chloride.

23. A method for producing Ti or Ti alloys through reduction by Ca according to claims 12, wherein Ti or Ti alloys to be generated are particles with an average particle size of 0.5 – 50 μm.